



Intel® E7230 Chipset Memory Controller Hub (MCH)

Specification Update

August 2007

Notice: The Intel® E7230 MCH chipset may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are documented in this Specification Update.

Document Number: 308334-002



INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. Intel products are not intended for use in medical, life saving, or life sustaining applications.

Intel may make changes to specifications and product descriptions at any time, without notice.

Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them.

The Intel® E7230 chipset MCH may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

Intel and the Intel logo are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

*Other names and brands may be claimed as the property of others.

Copyright © 2007, Intel Corporation



Contents

Revision History 4

Preface 5

Summary Tables of Changes 6

Identification Information 8

Errata 9

Specification Changes 14

Specification Clarifications 15

Documentation Changes 16

Revision History

Revision	Description	Date
-001	<ul style="list-style-type: none"> Initial release 	July 2005
-002	<ul style="list-style-type: none"> Added Erratum #15 	August 2007

§



Preface

This document is an update to the specifications contained in the documents listed in the following Affected Documents/Related Documents table. It is a compilation of device and document errata and specification clarifications and changes, and is intended for hardware system manufacturers and for software developers of applications, operating system, and tools.

Information types defined in the Nomenclature section of this document are consolidated into this update document and are no longer published in other documents. This document may also contain information that has not been previously published.

Affected Documents

Document Title	Document Number/Location
Intel® E7230 Chipset Memory Controller Hub (MCH) Datasheet	308333-001

Nomenclature

Errata are design defects or errors. Errata may cause the behavior of the Intel® E7230 MCH chipset to deviate from published specifications. Hardware and software designed to be used with any given stepping must assume that all errata documented for that stepping are present on all devices.

Specification Changes are modifications to the current published specifications. These changes will be incorporated in the next release of the specifications.

Specification Clarifications describe a specification in greater detail or further highlight a specification's impact to a complex design situation. These clarifications will be incorporated in the next release of the specifications.

Documentation Changes include typos, errors, or omissions from the current published specifications. These changes will be incorporated in the next release of the specifications.

Summary Tables of Changes

The following table indicates the Specification Changes, Errata, Specification Clarifications or Documentation Changes, which apply to the listed MCH steppings. Intel intends to fix some of the errata in a future stepping of the component, and to account for the other outstanding issues through documentation or Specification Changes as noted. This table uses the following notations:

Codes Used in Summary Table

Stepping

X:	Erratum, Specification Change or Clarification that applies to this stepping.
(No mark) or (Blank Box):	This erratum is fixed in listed stepping or specification change does not apply to listed stepping.

Status

Doc:	Document change or update that will be implemented.
PlanFix:	This erratum may be fixed in a future stepping of the product.
Fixed:	This erratum has been previously fixed.
NoFix:	There are no plans to fix this erratum.

Row

Shaded:	This item is either new or modified from the previous version of the document.
---------	--



NO.	A1	PLANS	ERRATA
1	X	NoFix	PCI Express* SKP/InitFCx Contention.
2	X	NoFix	PCIEXBAR Decode Fails When Using Size=64 MB or 128 MB and MCHBAR is Not Aligned to 256 MB.
3	X	NoFix	PCI Express Port related status register bits which drive SERR generation logic are never automatically cleared.
4	X	NoFix	Corrupted Packets Incorrectly Detected as Fatel Errors on PCI Express Port
5	X	NoFix	Packet Dropped When Replay Timer Expires and Replay is in Progress
6	X	NoFix	LOCK to non-DRAM Memory Flag (Register C8, Bit 9) is Getting Asserted
7	X	NoFix	The PCI Express Port Does Not Send The Correct TLP Type Downstream When There is a Memory Read Request-Locked TLP
8	X	NoFix	PCI Express Port Skip Sequence is Not Transmitted When Entering Recovery State
9	X	NoFix	STPCLK# Throttling May Cause System to Hang
10	X	NoFix	The Transaction Layer Resets the Completion Timer Counter before Receiving a Passing CRC from the Link Layer on the PCI Express Port
11	X	NoFix	Malformed Upstream IO or Configuration Write Cycles Are Not Being Detected As Malformed on PCI Express Port
12	X	NoFix	Excessive Clock Jitter Observed on Intel® E7230 Chipset Reference Design Platforms
13	X	NoFix	PCI Express Port is Recognizing an Invalid Transaction with a CRC Error from an Agent as Completed with CRS Status
14	X	NoFix	PCI Express Port Flow Control Updates Being Sent in During PM_REQ_ACK Stream
15	X	No Fix	Relaxed Ordering Queue

NO.	A1	SPECIFICATION CHANGES
1	X	There are no specification changes.

NO.	A1	SPECIFICATION CLARIFICATIONS
1	X	There are no specification clarifications.

NO.	A1	DOCUMENTATION CHANGES
1	X	There are no documentation changes.

Identification Information

Component Identification via Programming Interface

The Intel® E7230 MCH may be identified by the following register contents:

Stepping	Vendor ID ¹	Device ID ²	Revision Number ³
A1	8086h	2778h	01h

NOTES:

1. The Vendor ID corresponds to bits 15:0 of the Vendor ID Register located at offset 00–01h in the PCI function 0 configuration space.
2. The Device ID corresponds to bits 15:0 of the Device ID Register located at offset 02–03h in the PCI function 0 configuration space.
3. The Revision Number corresponds to bits 7:0 of the Revision ID Register located at offset 08h in the PCI function 0 configuration space.

Component Marking Information

The Intel® E7230 MCH may be identified by the following component markings:

Stepping	Product	Q-Spec	Lead/PbFree	Top Marking	Notes
A1	MCH	SL8KJ	PbFree	QGE7230	Production Samples
A1	MCH	SL8KK	Leaded	NQE7230	Production Samples

§

Errata

1. PCI Express SKP/InitFCx Contention.

Problem: During Intel® E7230 chipset PCI Express initialization, if a SKP is being transmitted immediately before an InitFCx DLLP, then a partial InitFCx may be transmitted.

Implication: A slight delay (less than 100 ns) may occur during link initialization. Device may report correctable error. InitFCx will automatically be repeated.

Workaround: None

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

2. PCIEXBAR Decode Fails When Using Size = 64 MB or 128 MB and MCHBAR is Not Aligned to 256 MB.

Problem: When accesses are to Device 0 and 1 on the configuration bus using the enhanced configuration mechanism and the size is set to 64M and the address is aligned to a 128M or 64M boundary, the transaction gets decoded as a type 1 transaction on the backbone instead of the configuration bus.

Implication: May cause failure to boot or may lead to a system hang.

Workaround: Set the length to 64 MB or 128 MB and align it to a 256 MB boundary.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

3. PCI Express Port related status register bits which drive SERR generation logic are never automatically cleared.

Problem: PCI Express Port related status register bits which drive SERR generation logic are never automatically cleared. This includes being sticky through warm reset.

Implication: Follow-on (any after first occurrence) errors of same type are ignored because associated status bit is not cleared.

Workaround: BIOS Workaround available. Contact your Intel Field Representative for the latest BIOS information.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

4. Corrupted Packets Incorrectly Detected as Fatal Errors on PCI Express Port

Problem: When the MCH receives a corrupted packet, it may incorrectly detect the corrupted packet as a malformed TLP.

Implication: The MCH may end up detecting a malformed TLP (fatal error) instead of just identifying it as a correctable error on the next valid packet. This issue has only been observed in a synthetic stress test

environment and requires the packet corruption to occur in combination with very specific boundary conditions.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

5. Packet Dropped When Replay Timer Expires and Replay is in Progress

Problem: When a packet replay is in progress on the PCI Express Port, and if some but not all of the packets to be replayed are acknowledged and the replay timer expires on the same clock cycle as the replay start of the first unacknowledged packet, the next packet in the replay buffer may be sent with an old sequence number. That packet is seen by receiver side as a duplicate and subsequently dropped.

Note: This has only been reproduced in a synthetic test environment with heavy error injection.

Implication: A fatal error may be registered by the MCH and the system may hang.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

6. LOCK to non-DRAM Memory Flag (Register C8, Bit 9) is Getting Asserted

Problem: A CPU lock cycle request is unintentionally being recognized as request to a non-system memory destination.

Implication: The MCH may incorrectly flag an error for a valid lock cycle that targets DRAM. A System Error (SERR) may be generated if enabled by System BIOS.

Note: The default setting for ERRCMD[9] Bus 0 Device 0 Offset CAh is to disable this reporting.

Workaround: Do not enable or change default setting of ERRCMD[9] Bus 0 Device 0 Offset CAh (SERR reporting for Lock cycles to non-DRAM Memory)

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

7. The PCI Express Port Does Not Send The Correct TLP Type Downstream When There is a Memory Read Request-Locked TLP

Problem: Upstream Transaction Layer Packet (TLP) Type, Memory Read Request-Locked (MRdLk), is an unsupported request for the MCH on the PCI Express Port. The Transaction Layer receives the MRdLk and sends downstream a Completion without Data (Cpl) TLP type with an unsupported request status. The correct behavior should be to send a Completion for Locked Memory Read without Data (CplLk) TLP type with an unsupported request status.

Implication: None. PCI Express 1.0a compliant devices are not allowed to send locked requests upstream.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.



8. PCI Express Port Skip Sequence is Not Transmitted When Entering Recovery State

Problem: PCI Express Port Skip Sequence in a non-common clock configuration is not transmitted when the skip latency counter expires exactly at the same time the MCH is entering the recovery state. The MCH sends the COM symbol (K28.5) followed by idles instead of skip sequence symbols.
Note: This has only been reproduced in a synthetic test environment and only applies to systems that use a non-common clock configuration.

Implication: None. Skip Sequence Symbol generation is not a requirement for proper operation in systems that implement common clock configurations.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

9. STPCLK# Throttling May Cause System to Hang

Problem: In platforms that use STPCLK# throttling in conjunction with devices that invoke the PHOLD mechanism in the ICH7 (e.g. floppy drives), a boundary condition can occur in the system resulting in the number of STPCLK# acknowledges to be out of synchronization. The failure occurs if a STPCLK# acknowledge cycle is retried on the front side bus at the same time as an internal MCH throttling counter is incremented.
Note: This has only been reproduced in a synthetic test environment under extreme thermal throttling conditions.

Implication: The system may hang.

Workaround: STPCLK# throttling is not necessary in server systems that meet Intel's thermal guidelines and therefore should be disabled by the BIOS. BIOS Workaround available. Contact your Intel Field Representative for the latest BIOS information.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

10. The Transaction Layer Resets the Completion Timer Counter before Receiving a Passing CRC from the Link Layer on the PCI Express Port

Problem: The PCI Express Port is resetting the completion timer before receiving a Transaction Layer Packet (TLP) with a passing Cyclic Redundancy Check (CRC) indicator from the Link Layer. The completion timer should only be resetting when there is a passing CRC indicator from the Link Layer.
Note: This has only been reproduced in a synthetic test environment.

Implication: None known.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

11. Malformed Upstream IO or Configuration Write Cycles Are Not Being Detected As Malformed on PCI Express Port

Problem: Malformed upstream IO or configuration write cycles are not being properly detected. The IO or configuration write cycles are put in the upstream non-posted queue as an invalid cycle and an

unsupported request completion is returned instead of a fatal error.
 Note: This has only been reproduced in a synthetic test environment.

Implication: None. PCI Express 1.0a compliant devices are not allowed to send I/O or Configuration cycles upstream.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

12. Excessive Clock Jitter Observed on Intel® E7230 Chipset Reference Design Platforms

Problem: DDR2-667 system memory clocks outperform the tCL/tCH spec of 48/52 by reaching 49/51, but do not meet the below listed JEDEC balloted DDR2-667 DRAM Device jitter values at all times. The jitter limits were measured at about the 9-sigma level.

Parameter	JEDEC Value	MCH Value
tJIT(per)	125	290
tJIT(cc)	250	470
tJIT(duty)	125	150
tERR(2per)	175	350
tERR(3per)	225	450
tERR(4per)	250	545
tERR(5per)	250	600

Implication: None. Intel has characterized the system memory clocks and system timing margins and shared the data with the major DRAM suppliers. Intel has determined and the major DRAM suppliers agree that this system clock errata should not cause memory-clock functionality or timing related issues providing all other DRAM related interface timing specifications are fulfilled according to DDR2 Intel specification addendum and JEDEC DDR2 DRAM specification, and the Intel® E7230 design guidelines.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

13. PCI Express Port is Recognizing an Invalid Transaction with a CRC Error from an Agent as Completed with CRS Status

Problem: If the MCH has a downstream I/O cycle or Memory Read outstanding, and receives for that cycle a completion TLP that has been corrupted in such a way that the status is “Configuration Retry” (which is illegal), and another corruption within the same TLP appears as a premature “END” symbol, then the MCH may violate system ordering rules.

Note: This has only been reproduced in a synthetic simulation test environment with heavy error injection.

Implication: Anomalous system behavior could result if the exact scenario described above occurs.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.



14. PCI Express Port Flow Control Updates Being Sent in During PM_REQ_ACK Stream

Problem: A flow control update DLLP may be sent in the middle of continuous PM_REQ_ACK packets while entering L2/L3 Ready state. This link state is only used when entering the S4/S5 system power management states.

Implication: None known. No system failures have been observed. System will still enter S4/S5 power management states.

Workaround: None.

Status: NoFix. For affected steppings, see the *Summary Table of Changes*.

15. Relaxed Ordering Queue

Problem: The 7230 MCH may experience an internal race condition between the host and PCI Express internal clocks and may experience a hang when the following conditions are met simultaneously:

- 1) When using a PCI Express endpoint (connected to MCH) that is generating at least 12 outstanding read requests to memory, with at least one of those requests setting the Relaxed Ordering attribute
- 2) The CPU generates a downstream write burst (including a non-posted) to the PCI Express endpoint that stalls due to lack of PCI Express posted credits
- 3) The MCH allows the Relaxed Order read completion to pass the posted memory write

Note: This has only been found in a synthetic testing environment.

Implication: System may exhibit a hang with either of the three failing signatures:

- 1) MCH doesn't respond with completion to PCI Express-mem read (read completes on DDR2 I/F)
- 2) MCH responds with 2 completions (instead of 1) with duplicate tags in response to PCI Express-mem read (read also completes on DDR2 I/F)
- 3) CPU to PEG downstream write completes on FSB but never gets requested on PEG

Workaround: Refer to 7230 BIOS Spec Update

Status: No Fix. For affected steppings, see the *Summary Table of Changes*.

Specification Changes

There are no Specification Changes in this Specification Update revision.



Specification Clarifications

There are no specification clarifications in this Specification Update revision.

Documentation Changes

There are no documentation changes in this Specification Update revision.

§